

LISTING OF THE CLAIMS:

1. (Previously Presented) An apparatus to measure micro-forces due to interactions between a predetermined substance and a sensing material that binds the substance, the apparatus comprising:

a cantilever palette including a plurality of cantilever array blocks, each cantilever array block including a plurality of cantilevers, each cantilever including a plurality of cantilever fingers surrounded by a frame with frame fingers, the cantilever fingers and the frame fingers forming a diffraction grating, wherein each cantilever finger in the array block comprises the sensing material selected to interact with the substance predetermined for measurement by the apparatus, such that cantilevers of the cantilever array block deflect in the presence of the substance, causing the diffraction grating to diffract light and thereby provide a change in a diffraction pattern or color of the diffracted light, as a visual indication of the presence of the substance, and wherein the apparatus does not require an external source of electrical power for the cantilever palette.

2. (Canceled)

3. (Previously Presented) The apparatus of claim 1 wherein the substance is a chemical.

4. (Previously Presented) The apparatus of claim 1 wherein the substance is an antibody or an antigen.

5. (Previously Presented) The apparatus of claim 1 wherein each cantilever array block of the plurality of cantilever array blocks comprises one of a plurality of different sensing materials, respectively, and each sensing material interacts with a different predetermined substance.

6. (Previously Presented) The apparatus of claim 1 wherein each cantilever array block of the plurality of cantilever array blocks comprises sensing material that interacts with a predetermined level of a single predetermined substance.

7. (Previously Presented) The apparatus of claim 1 wherein the plurality of cantilever array blocks includes cantilever array block subsets, each cantilever array block subset comprises sensing material that interacts with a different predetermined substance, respectively, and each cantilever array block within each cantilever array block subset comprises sensing material that interacts with a predetermined level of the predetermined substance.

8-11. (Canceled)

12. (Original) The apparatus of claim 1 further comprising image enhancement devices selected from the group consisting of: a beam splitter, a visible lens, and a spatial filter.

13. (Previously Presented) The apparatus of claim 1 further comprising a pin hole array attached to the cantilever palette.

14. (Previously Presented) A method of identifying the presence of a chemical substance in a liquid test environment, the method comprising the steps of:

forming a cantilever palette including a plurality of cantilever array blocks, each cantilever array block including a plurality of cantilevers, each cantilever including a plurality of cantilever fingers surrounded by a frame with frame fingers, the cantilever fingers and the frame fingers forming a diffraction grating, wherein the cantilever fingers comprise a sensing material selected to preferentially bind and thereby identify the presence of the substance, wherein the cantilever palette does not require an external electrical power source;

exposing the cantilever palette to the test liquid comprising the a substance, thereby causing cantilevers of the cantilever array block to deflect such that the diffraction grating produces diffracted light; and

visually observing the diffracted light from the diffraction grating to identify the presence of the substance.

15. (Canceled)

16. (Previously Presented) The method of claim 14 further comprising prior to the forming step, configuring each cantilever array block of the plurality of cantilever array blocks to be responsive to a different predetermined substance.

17. (Previously Presented) The method of claim 14 further comprising prior to the forming step, configuring each cantilever array block of the plurality of cantilever array blocks to be responsive to a predetermined level of a single predetermined substance.

18. (Previously Presented) The method of claim 14 further comprising prior to the forming step, selecting different substances and levels of each of a plurality of substances to be identified; forming cantilever array block subsets; and configuring each cantilever array block subset to be responsive to a different predetermined substance, and configuring each cantilever array block within each cantilever array block subset to be responsive to a predetermined level of the predetermined substance.

19-21. (Canceled)

22. (Previously Presented) The apparatus of claim 1, wherein the cantilever fingers of the cantilever palette interact with the substance in the liquid, and deflect from an initial position with respect to the frame fingers of the cantilever palette, to alter the diffraction grating.

23. (Canceled)

24. (Previously Presented) The apparatus of claim 22, wherein the sensing material comprises a monoclonal antibody and the predetermined substance comprises an

antigen, wherein the monoclonal antibody binds to the antigen and the cantilever fingers deflect in the presence of the antigen.

25. (Previously Presented) The method of claim 14, wherein observing the diffracted light in the test environment further comprises comparing diffraction of incident light prior to and after exposing the cantilever palette to the test environment.

26. (Previously Presented) The method of claim 25, wherein:
exposing the cantilever palette to the test environment further includes exposing the cantilever palette to incident white light; and

visually observing the diffracted light for a change in color, pattern, or intensity to determine if the predetermined substance is preferentially bound to the cantilevers to identify the physical property which is at least one of the presence of the predetermined substance and the level of the predetermined substance.

27. (Previously Presented) The method of claim 26, wherein the cantilever fingers comprise a sensing material which is a biomolecule that preferentially binds to the predetermined substance.

28. (Previously Presented) The method of claim 27, wherein the biomolecule comprises a monoclonal antibody, and the predetermined substance comprises an antigen that binds to the monoclonal antibody, wherein the cantilever fingers deflect in response to binding of the antigen.

29. (Previously Presented) The method of claim 14, wherein observing the diffracted light in the test environment further comprises comparing diffraction of incident light after exposing the cantilever palette to the test environment, and to an environment in the absence of the substance or in the presence of a predetermined amount of the substance.

30. (Previously Presented) An apparatus to detect a substance in an environment, comprising:

a cantilever array block, the cantilever array block including a plurality of cantilevers comprising a plurality of cantilever fingers surrounded by a frame with a plurality of frame fingers, the cantilever fingers and frame fingers forming a diffraction grating, the cantilever fingers comprising a substrate material and a sensing material which is predetermined to respond to the substance, wherein the cantilevers fingers deflect in a presence of the substance, causing the diffraction grating to diffract light and thereby provide visual indicia of the physical property, and the cantilever array block does not require an external electrical power source.

31. (Previously Presented) The apparatus of claim 30, wherein the visual indicia of the diffraction grating are selected from a group of changes in diffraction consisting of changes in color, changes in intensity, and changes in pattern of the diffracted light.

32. (Previously Presented) An apparatus to measure a chemical-mechanical micro-force, comprising:

a cantilever palette including at least one cantilever array block, the at least one cantilever array block including a plurality of cantilevers with cantilever fingers, the cantilever fingers surrounded by a frame with frame fingers, the cantilever fingers and the frame fingers forming a diffraction grating, wherein the cantilever fingers comprise a material selected as a binding reagent, such that in a presence of a ligand of the binding reagent, the cantilever fingers deflect, causing the diffraction grating to diffract light and thereby provide visual indications of the a presence of the ligand, wherein the apparatus does not require an external electrical power source.

33. (Previously Presented) A sensor for detecting a chemical substance, the sensor comprising:

a first cantilever array including a plurality of first cantilever fingers, each first cantilever finger including a sensing material, such that the sensing material in a presence of the substance binds to the first cantilever in a presence of the substance;

a second cantilever array including a plurality of second cantilever fingers, the first and second cantilever arrays being disposed with respect to each other such that the first cantilever fingers are surrounded by the second cantilever fingers; wherein

the first and second cantilever fingers form a diffraction grating having an effect on light from a light source, wherein the effect of the diffraction grating on the light varies as the first cantilevers bend, such that the variation of the effect corresponds to a variation in the presence of the substance, wherein the apparatus does not require an external electrical power source.

34. (Previously Presented) The sensor of claim 33, wherein the sensing material is mounted on a surface of each of the first cantilever fingers and binds the substance to the surface so as to cause each of the first cantilever fingers to bend.

35. (Previously Presented) The sensor of claim 33, wherein the light source is incident light.

36. (Previously Presented) An apparatus to measure interactions between a predetermined substance and a sensing material that binds the substance, the apparatus comprising:

a cantilever palette including a plurality of cantilever array blocks, each cantilever array block including a plurality of cantilevers, each cantilever including a plurality of cantilever fingers surrounded by a frame with frame fingers, the cantilever fingers and the frame fingers forming a diffraction grating, wherein each cantilever array block comprises the sensing material selected to interact with the substance predetermined for measurement by the apparatus, such that cantilevers of the cantilever array block deflect in the presence of the substance, causing the diffraction grating to diffract light and thereby provide a change in a diffraction pattern or color of the diffracted light, as a visual indication of the presence of the substance, and wherein the apparatus does not require an external electrical power source, and wherein the sensing material comprises a monoclonal antibody and the substance comprises an

antigen, wherein the monoclonal antibody binds to the antigen and the cantilever fingers deflect in the presence of the antigen.